Citation:

Keller HH, Ostbye T. Body mass index (BMI), BMI change and mortality in community-dwelling seniors without dementia. *J Nutr Health Aging.* 2005; 9 (5): 316-320.

PubMed ID: 16222397

Study Design:

Cohort study

Class:

B - Click here for explanation of classification scheme.

Research Design and Implementation Rating:

POSITIVE: See Research Design and Implementation Criteria Checklist below.

Research Purpose:

To investigate the predictive ability of the BMI categories identified in the WHO Weight Classification System and change in BMI on mortality in Canadian seniors.

Inclusion Criteria:

- Canadian Study of Health and Aging participants who completed clinical examination in 1991 and 1996 were included
- Participants with height and weight from CSHA1 and CSHA2, as well as information about whether they died between CSHA2 and CSHA3.

Exclusion Criteria:

- Those who died in the first five years of follow-up
- Those diagnosed with dementia at CSHA2 and were not followed to CSHA3 (N=317)
- Those lost to follow-up between CSHA2 and CSHA3 (N=23).

Description of Study Protocol:

Recruitment

The Canadian Study of Health and Aging (CSHA) is a national multi-center cohort study of dementia, as well as a longitudinal health study of elderly Canadians. Of the 10,263 individuals 65 years and above surveyed in 1991 and 1992 (CSHA1), 9,008 were living in the community and 1,028 in long-term institutions. The very old were oversampled. 2,914 elderly underwent the clinical examination at CSHA1.

Design

Cohort study.

Statistical Analysis

- Descriptive analyses were completed for covariates included in the analyses
- Bivariate analyses were completed for weight change categories with other covariates
- Logistic regression controlled for age, gender, education level, marital status, smoking and cognitive status
- Odds ratios and 95% confidence intervals were calculated.

Data Collection Summary:

Timing of Measurements

CSHA1 occurred in 1991, CSHA2 in 1996 and CSHA3 in 2001.

Dependent Variables

- Five-year mortality (death between CSHA2 and CSHA3)
- Information about vital status was collected from a decedent questionnaire administered to a proxy resident at CSHA3
- Death certificate information was collected for most of the subjects who died.

Independent Variables

- Actual measurements of height (using stadiometer) and weight (using calibrated balance scales) recorded
- BMI change (CSHA1 to CSHA2) was categorized as no change or mild increase (between zero and two units), mild decrease (between -0.1 and -2.0 units) or significant increase or decrease (more than two units either way).

Control Variables

- Age
- Gender
- Education level
- Marital status
- Smoking
- Cognitive status at CSHA2.

Description of Actual Data Sample:

- *Initial N:* 2,914 elderly underwent the clinical examination at CSHA1.
- *Attrition (final N):* 539 participants included in the analysis,61% were female
- *Age*
    - *65 to 74 years:* 30.6%
    - *75 to 84 years:* 55.8%
    - *85 years or older:* 13.5%
- *Ethnicity:* Not mentioned
- *Location:* Canada.

Summary of Results:

Adjusted Relative Odds of Death Between 1996 and 2001: Multivariate Models (n = 539)

Variables	Model I *OR (95% CI)*	Model II *OR (95% CI)*	Model III *OR (95% CI)*
Age 75 to 84 years	3.46 (2.17, 5.53)	3.52 (2.19, 5.68)	3.89 (2.28, 6.63)
Age 85+ years	12.3 (6.30, 24.0)	11.4 (5.8, 22.3)	11.6 (5.3, 25.2)
Male	1.78 (1.21, 2.62)	1.91 (1.28, 2.84)	1.73 (0.99, 2.98)
BMI <18.5	1.84 (0.66, 5.18)	1.94 (0.68, 5.51)	1.95 (0.61, 6.31)
BMI, 25-29.9	0.74 (0.49, 1.12)	0.69 (0.45, 1.05)	0.70 (0.44, 1.11)
BMI 30+	1.01 (0.54, 1.90)	0.90 (0.47, 1.70)	0.91 (0.45, 1.86)
BMI Increase >2		1.32 (0.73, 2.40)	1.35 (0.71, 2.58)
BMI Decrease <2		1.12 (0.64, 1.96)	1.01 (0.55, 1.87)
BMI Decrease >2		2.27 (1.32, 3.91)	2.10 (1.17, 3.81)
Did Not Complete High School			1.27 (0.82, 1.97)
Never Married			0.49 (0.23, 1.08)
Divorced			1.08 (0.64, 1.84)
Smoking			1.50 (0.92, 2.44)
Cognitive Impairment			2.45 (1.59, 3.79)

Other Findings

- More than half of the participants at baseline were in the normal BMI category of 18.5 to 24.9 and only 3.5% were considered underweight
- Almost 60% lost weight between 1991 and 1996
- BMI at CSHA1 was not a significant predictor of all-cause mortality between CSHA2 and CSHA3
- A significant decrease in BMI, regardless of BMI category, predicted death (odds ratio, 2.10; 95% confidence interval, 1.17, 3.80)
- Other factors predictive of death were age and cognitive impairment without dementia.

Author Conclusion:

A two-unit change in BMI is a significant predictor of mortality in community-dwelling seniors without dementia. This BMI change translates into approximately five kg to seven kg over a five-year period or about one kg per year. Such a weight change is potentially important and future work should examine yearly weight change to determine if rate of weight change has an influence on mortality.

Reviewer Comments:

Authors note that there were very few seniors in the underweight category (3.5%), as well as the fact that those included in the analysis were "survivors," as the subjects who developed dementia were excluded.

Research Design and Implementation Criteria Checklist: Primary Research

Relevance Questions		
1.	Would implementing the studied intervention or procedure (if found successful) result in improved outcomes for the patients/clients/population group? (Not Applicable for some epidemiological studies)	N/A
2.	Did the authors study an outcome (dependent variable) or topic that the patients/clients/population group would care about?	Yes
3.	Is the focus of the intervention or procedure (independent variable) or topic of study a common issue of concern to nutrition or dietetics practice?	Yes
4.	Is the intervention or procedure feasible? (NA for some epidemiological studies)	N/A

Validity Questions		
1.	**Was the research question clearly stated?**	Yes
1.1.	Was (were) the specific intervention(s) or procedure(s) [independent variable(s)] identified?	Yes
1.2.	Was (were) the outcome(s) [dependent variable(s)] clearly indicated?	Yes
1.3.	Were the target population and setting specified?	Yes
2.	**Was the selection of study subjects/patients free from bias?**	Yes
2.1.	Were inclusion/exclusion criteria specified (e.g., risk, point in disease progression, diagnostic or prognosis criteria), and with sufficient detail and without omitting criteria critical to the study?	Yes
2.2.	Were criteria applied equally to all study groups?	Yes
2.3.	Were health, demographics, and other characteristics of subjects described?	Yes
2.4.	Were the subjects/patients a representative sample of the relevant population?	Yes
3.	**Were study groups comparable?**	N/A
3.1.	Was the method of assigning subjects/patients to groups described and unbiased? (Method of randomization identified if RCT)	N/A

3.2.	Were distribution of disease status, prognostic factors, and other factors (e.g., demographics) similar across study groups at baseline?	N/A
3.3.	Were concurrent controls used? (Concurrent preferred over historical controls.)	N/A
3.4.	If cohort study or cross-sectional study, were groups comparable on important confounding factors and/or were preexisting differences accounted for by using appropriate adjustments in statistical analysis?	N/A
3.5.	If case control or cross-sectional study, were potential confounding factors comparable for cases and controls? (If case series or trial with subjects serving as own control, this criterion is not applicable. Criterion may not be applicable in some cross-sectional studies.)	N/A
3.6.	If diagnostic test, was there an independent blind comparison with an appropriate reference standard (e.g., "gold standard")?	N/A
4.	**Was method of handling withdrawals described?**	Yes
4.1.	Were follow-up methods described and the same for all groups?	Yes
4.2.	Was the number, characteristics of withdrawals (i.e., dropouts, lost to follow up, attrition rate) and/or response rate (cross-sectional studies) described for each group? (Follow up goal for a strong study is 80%.)	N/A
4.3.	Were all enrolled subjects/patients (in the original sample) accounted for?	Yes
4.4.	Were reasons for withdrawals similar across groups?	N/A
4.5.	If diagnostic test, was decision to perform reference test not dependent on results of test under study?	N/A
5.	**Was blinding used to prevent introduction of bias?**	Yes
5.1.	In intervention study, were subjects, clinicians/practitioners, and investigators blinded to treatment group, as appropriate?	N/A
5.2.	Were data collectors blinded for outcomes assessment? (If outcome is measured using an objective test, such as a lab value, this criterion is assumed to be met.)	Yes
5.3.	In cohort study or cross-sectional study, were measurements of outcomes and risk factors blinded?	Yes
5.4.	In case control study, was case definition explicit and case ascertainment not influenced by exposure status?	N/A
5.5.	In diagnostic study, were test results blinded to patient history and other test results?	N/A
6.	**Were intervention/therapeutic regimens/exposure factor or procedure and any comparison(s) described in detail? Were interveningfactors described?**	Yes

6.1.	In RCT or other intervention trial, were protocols described for all regimens studied?	N/A
6.2.	In observational study, were interventions, study settings, and clinicians/provider described?	Yes
6.3.	Was the intensity and duration of the intervention or exposure factor sufficient to produce a meaningful effect?	Yes
6.4.	Was the amount of exposure and, if relevant, subject/patient compliance measured?	N/A
6.5.	Were co-interventions (e.g., ancillary treatments, other therapies) described?	N/A
6.6.	Were extra or unplanned treatments described?	N/A
6.7.	Was the information for 6.4, 6.5, and 6.6 assessed the same way for all groups?	N/A
6.8.	In diagnostic study, were details of test administration and replication sufficient?	N/A
7.	**Were outcomes clearly defined and the measurements valid and reliable?**	Yes
7.1.	Were primary and secondary endpoints described and relevant to the question?	Yes
7.2.	Were nutrition measures appropriate to question and outcomes of concern?	Yes
7.3.	Was the period of follow-up long enough for important outcome(s) to occur?	Yes
7.4.	Were the observations and measurements based on standard, valid, and reliable data collection instruments/tests/procedures?	Yes
7.5.	Was the measurement of effect at an appropriate level of precision?	Yes
7.6.	Were other factors accounted for (measured) that could affect outcomes?	Yes
7.7.	Were the measurements conducted consistently across groups?	N/A
8.	**Was the statistical analysis appropriate for the study design and type of outcome indicators?**	Yes
8.1.	Were statistical analyses adequately described and the results reported appropriately?	Yes
8.2.	Were correct statistical tests used and assumptions of test not violated?	Yes
8.3.	Were statistics reported with levels of significance and/or confidence intervals?	Yes
8.4.	Was "intent to treat" analysis of outcomes done (and as appropriate, was there an analysis of outcomes for those maximally exposed or a dose-response analysis)?	N/A

8.5.	Were adequate adjustments made for effects of confounding factors that might have affected the outcomes (e.g., multivariate analyses)?	Yes
8.6.	Was clinical significance as well as statistical significance reported?	Yes
8.7.	If negative findings, was a power calculation reported to address type 2 error?	N/A
9.	**Are conclusions supported by results with biases and limitations taken into consideration?**	Yes
9.1.	Is there a discussion of findings?	Yes
9.2.	Are biases and study limitations identified and discussed?	Yes
10.	**Is bias due to study's funding or sponsorship unlikely?**	Yes
10.1.	Were sources of funding and investigators' affiliations described?	Yes
10.2.	Was the study free from apparent conflict of interest?	Yes